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STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
LEAVITT, MARIA GOMEZ	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/839,536	APT ET AL.	
	Examiner	Art Unit	
	MARIA LEAVITT	1633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 June 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) *11-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 23-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-55 are pending. Applicant's election **without traverse** of Group I, drawn to an algal cell comprising a chimeric DNA encoding a transport protein, i.e., claims 1-10, in Applicant's reply filed on 04-11-2008 in response to the restriction requirements of 01-11-2008 was previously acknowledged.

Applicant's amendment filed on 08-25-2009, which added new claims 23-55, necessitates the supplemental restriction requirement filed on 05-13-2010 which is applied to the elected invention of Group I, drawn to an algal cell comprising a chimeric DNA encoding a transport protein, claims 1-10.

Applicants' election *with traverse* of the following species in response to the restriction requirements of 05-13-2010 is acknowledged: (1) "Baccilariophyta" as the species of marine algal cells as recited in claims 26 and 42, (2) a "*Phaeodactylum* cell" as the species of "Baccilariophyta" as recited in claims 27 and 43, (3) fcpA as the species of promoter as recited in claim 47, (4) Glut1 as the species of hexose transporter as recited in claims 38 and 54, (5) "a sugar" as the catabolizable carbon source, and (6) "sut1" as the sucrose (disaccharide) transporter.

Response to Applicants' arguments

Applicant's traversal is that the restriction in not clear and too extensive, that a search of prior art would be overlapped, and the there is no undue burden to do a search of all the species as listed in the claims. Specifically, Applicants argue that: 1) a search

for the fucoxanthin chlorophyll binding protein promoter fcpA would necessary overlap with searches for *fcpB, fcpC* and *fcpE* because the searches would necessarily relate to common functions of these promoters, 2) the searches will be conducted in the same field of search, 3) a search for the two species of hexose transport proteins Glutl and Hupl will overlap, and 4) a search for one type of Baccilariophyta cell, such as Phaeodactylum, would necessarily overlap searches for other types such as Nitzschia, Navicula, and Thalassiosira cells based on their common relation as Baccilariophyta cells.

Regarding 1) and 3), Applicants' arguments have been found persuasive. Accordingly, the examiner has withdrawn the species restriction requirement in relation to the fucoxanthin chlorophyll binding protein promoter *fcpA* and *fcpB, fcpC* and *fcpE* as a search of all species together does not represent undue burden, and the species restriction requirement in relation the hexose transport proteins Glutl (isolated from human erythrocytes) and Hupl (isolated from *Chlorella kessleri*), as examination of both species together does not represent undue burden. Regarding 2) and 4), however, Applicants' arguments have been fully considered but deemed unpersuasive.

Regarding 2), Applicants' arguments that the examiner must show burden of searching by separate classification and separate status in the art are not persuasive because classification is a very broad grouping of inventions and distinct and different inventions are present in a particular class/subclass. Note that related inventions in the same statutory class are considered mutually exclusive or not overlapping in scope, if a first invention would not infringe a second invention, and the second invention would not infringe the first invention.

Regarding 4), the fact that Nitzschia, Navicula, and Thalassiosira and Phaeodactylum belong to the same genus of Baccilariophyta is not disputed. However, the inventions are distinct because each of the Baccilariophyta species is encoded by different genes coding for proteins resulting in different phenotypes such as different uptake and metabolism of small organic molecules. As such, not only a prior art search has to be conducted for each of the species, a prior art consideration and/or examination of arts relevant to the claimed invention as a whole would be unduly burdensome to the examiner. Further, the as-filed specification provides similar insight into the uniqueness of each alga cell when it discloses that different diatoms may be facultative heterotrophic or obligate photoautotrophic (incapable of growth on glucose) such as *Phaeoductylum tricornutum.*

Claims 11-22 were previously withdrawn from consideration as being directed to non-elected inventions pursuant to 37 CFR1.14(b), there being no allowable generic or linking claim. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

The requirement is still deemed proper and made Final. It is noted that when a final requirement for restriction is made by the examiner, applicant may file a petition under 37 CFR 1.144 for review of the restriction requirement. The propriety of a requirement to restrict, if traversed, is reviewable by petition under 37 CFR 1.144 . In re Hengehold, 440 F.2d 1395, 169 USPQ 473 (CCPA 1971).

Therefore, claims 1-10 and 23-55 are currently under examination to which the following grounds of rejection are applicable.

Withdrawn objections/rejections in response to Applicants' arguments or amendments:

Claim Objection

In view of Applicants' amendment of claims 1 and 6, objection to claims 1 and 6 has been withdrawn.

Statutory Double Patenting — 35 U.S.C. 101

In view of Applicants amendment of the claims filed on 08-25-2009, rejection of claims 1-22 provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-22 of copending U.S. Patent Application No. 11,842,887 has been withdrawn.

Rejections maintained in response to Applicants' arguments or amendments

Claim Rejections - 35 USC § 102(b)

Claims **1, 3, 5, 6, 8, and 10** remain rejected and new claims **24, 25, 32, 33, 35, 37, 39, 40, 41, 48, 49, 51, 53 and 55** are rejected under 435 U.S.C. 102(b) as being anticipated by Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) as evidenced by Harasawa U.S. Patent 4,235,043 (Date of Patent Nov. 25, 1980).

Hallmann et al. teaches transgenic *Volvox* algae able to synthesize a functional hexose/H+ symporter (HUP1) from *Chlorella* under the control of the constitutive *Volvox* beta-tubulin promoter which reads on an algal cell comprising a chimeric DNA encoding a protein that transport a catabolizable carbon source into the alga cell as required in claims 1 and 7. Hallmann teaches that alga *Volvox* is obligately photoautotrophic (e.g., acquires its chemical energy from the photosynthetic light-dependent reactions). Transformants *Volvox* algae were grown in an 8-h dark/ 16-h light cycle, (p. 669, col. 2, paragraph 4; p. 623, col. 2; p. 671, col. 1, last paragraph**).** Note that 8h dark is

substantially dark since claim 1 does not place any limitation in reference to the time length of a dark/light cycle **(Claims 1 and 24).**

Additionally, Hallmann et al. discloses that *Volvox* algae exhibited survival after prolonged incubation in the dark in a glucose –containing medium in the absence of light in contrast to the corresponding wild type *Volvox* algae (col. 1, last paragraph (e.g., growth sustained for longer periods in the dark because of the presence of the hexose transporter in the transformant algae related to wild-type Volvox organisms which die after prolonged incubation in the dark) **(Current claims 3, 5, 32, 33, 35, 37, 39 and 40).** Note that transformants *Volvox* algae exhibited survival after prolonged incubation in the dark in a glucose –containing medium because of the import of glucose as the source of carbon and energy in the absence of light in contrast to their wild type *Volvox* algae, said property reading also on a transformed algae able to grow heterotrophically e.g., an external source of organic compounds is used in the absence of light), reading on cells that without the chimeric DNA are phototrophic cells **(Current claim 6 and 8, 10, 40, 48, 49, 51, 53 and 55).** Also note that as the Hallmann et al. publication teaches *Volvox* algae expressing the an heterologous HUP1 transporter, then any activity resulting from the expression of the HUP1 protein such as supporting heterotrophic growth of the cell is inherently anticipated because the structure of the algal cell is the same.

Note that photoautotrophic alga Volvox belongs to the division of Chlorophyta, Order Volvocales as evidenced by Harasawa (col. 19, lines 15-32) (Current **claims 25 and 41**).

Applicants have not submitted new arguments to rebut rejection of claims under 35 USC § 102 made in the Office Action filed on 02-25-2009. Therefore claims **1, 3, 5, 6, 8, and 10** remain rejected and new claims **24, 25, 32, 33, 35, 37, 39, 40, 41, 48, 49, 51, 53**

and 55 are rejected under 35U.S.C. 102 for the reasons of record and the reasons stated in the paragraph above.

Claim Rejections - 35 USC § 103

Claims 1, 2, 6 and 7 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) in view of Dunahay et al., (*J. Phycol*. pp. 1004-1012, of record) and further in view of Fisher et al., (1999, J. Phycol. pp. 113-120, of record).

Applicants have not submitted new arguments to rebut rejection of claims under 35 USC § 103(a) made in the Office Action filed on 02-25-2009. Therefore claims **1, 2, 6 and 7** remain rejected under 35U.S.C. 103 for the reasons of record.

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Claims 4 and 9 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) in view of Dunahay et al., (*J. Phycol*. pp. 1004-1012, of record) and further in view of Fisher et al., (1999, J. Phycol. pp. 113-120, of record) as applied to claims **1, 2, 6 and 7 above** and further in view of Lemoine et al., (1999, FEBS Letters pp. 325-330),

Applicants have not submitted new arguments to rebut rejection of claims under 35 USC § 103(a) made in the Office Action filed on 02-25-2009. Therefore claims **4 and 9** remain rejected under 35U.S.C. 103 for the reasons of record.

New grounds of objection/ rejection

Notice To Comply With Sequence Rules For Patent Applications Containing nucleotide Sequence And/Or Amino acid Sequence Disclosures

A review of the instant claims shows that this application contains sequence disclosures that are encompassed by the definitions for nucleotide and/or amino acid sequences set forth in 37 CFR 1.821(a)(1) and (a)(2). However, this application fails to comply with the requirements of 37 CFR 1.821 through 1.825 for the reason(s) set forth below or on the attached Notice To Comply With Requirements For Patent Applications Containing Nucleotide Sequence And/Or Amino Acid Sequence Disclosures.

The claims and description do not comply with 37 CFR §1.821(d), which states:

> 37 CFR § 1.821 Nucleotide and/or amino acid sequence disclosures in patent applications –
> (a) Nucleotide and/or amino acid sequences as used in §1.821 through 1.825 are interpreted to mean an unbranched sequence of four or more amino acids or an unbranched sequence of ten or more nucleotides.
> (d) Where the description or claims of a patent application discuss a sequence that is set forth in the "Sequence Listing" in accordance with paragraph (c) of this section, reference must be made to the sequence by use of the sequence identifier, preceded by "SEQ ID NO:" in the text of the description or claims, even if the sequence is also embedded in the text of the description or claims of the patent application.

In the instant case, page 40, lines 10-23, sets forth nucleic acid sequences within the meaning of 37 CFR §1.821(a) without providing SEQ ID NO: identifiers. Applicants are required to amend the specification to identify the sequences with the corresponding SEQ ID Nos and to ensure that each SEQ ID NO: is provided in the initial or substitute CRF and paper copy sequence listing. Additionally, for completeness, Applicants are advised to review the entire disclosure for compliance with 37 CFR §1.821(d).

Full compliance with the sequence rules is required in response to this Office Action. A complete response to this office action should include both compliance with

the sequence rules, which include amendment of the specification and claims to include SEQ ID NOS., and a response to the rejections set forth below. Failure to comply with **both** these requirements in the time period set forth in this office action will be held non-responsive.

Provisional Rejection, Obviousness Type Double Patenting-

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-10 and 23-55 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-10 and 23-63 of copending Application No. 11/842898 filed on 08/21/2007. Although the conflicting claims are not identical, they are not patentably distinct from each other because they are obvious variants. The instant claims and the claims of the Application No. 11/842898 are obvious variants because both applications are broadly drawn to products and methods comprising:

An algal cell which grows in substantial absence of light, said cell comprising chimeric DNA encoding a protein which will transport a catabolizable carbon source into the algal cell, wherein the algal cell without the chimeric DNA is a phototrophic cell that would not grow under dark conditions.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

The specification does not provide a closed definition as to what is meant by a "microalgae"or "marine algal cells". As such, and in view of the customary and ordinary meaning of the term "microalgae " in the art as "microscopic algae, typically found in freshwater and marine systems"(Webster's Seventh New Collegiate Dictionary, G. C. Merriam Co.), the multicellular alga *Volvox,* one of the best-known chlorophytes, which is a freshwater alga and is found in ponds and ditches, even in shallow puddles, is embraced by both terms "microalgae"and "marine algal cells".

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 6, 23, 24, 25, 26, 27, 28-31 and 40-47 are newly rejected under 35 U.S.C. 103(a) as being unpatentable over Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) in view of Harasawa U.S. Patent 4,235,043 (Date of Patent Nov. 25, 1980) and further in view of Apt (*Mol Gen Gene*, 1996, 572-579) and Fisher et al., (1999*, J. Phycol*. pp. 113-120, of record). **This is a new rejection necessitated by amendment of the claims in the response filed 08/25/2009.**

Hallmann et al. teaches transgenic *Volvox* algae able to synthesize a functional hexose/H+ symporter (HUP1) from *Chlorella* under the control of the constitutive *Volvox* beta-tubulin promoter which reads on an algal cell comprising a chimeric DNA encoding a protein that transport a catabolizable carbon source into the alga cell as required in claims 1 and 6. Hallmann teaches that alga *Volvox* is obligately photoautotrophic (e.g., acquires its chemical energy from the photosynthetic light-dependent reactions).

Transformants *Volvox* algae were grown in an 8-h dark/ 16-h light cycle, (p. 669, col. 2, paragraph 4; p. 623, col. 2; p. 671, col. 1, last paragraph**).** Note that 8h dark is substantially dark since claim 1 does not place any limitation in reference to the time length of a dark/light cycle. Moreover, 8-h of darkness falls within the scope of total darkness**.**

Additionally, Hallmann et al. discloses that *Volvox* algae exhibited survival after prolonged incubation in the dark in a glucose –containing medium in the absence of light in contrast to the corresponding wild type *Volvox* algae (col. 1, last paragraph), reading on cells that without the chimeric DNA are phototrophic cells (e.g., growth sustained for longer periods in the dark because of the presence of the hexose transporter in the transformant algae related to wild-type Volvox organisms which die after prolonged incubation in the dark)**.** Note that transformants *Volvox* algae exhibited survival after prolonged incubation in the dark in a glucose –containing medium because of the import of glucose as the source of carbon and energy in the absence of light in contrast to their wild type *Volvox* algae, said property reading also on a transformed algae able to grow heterotrophically e.g., an external source of organic compounds is used in the absence of light. Note that photoautotrophic alga Volvox belongs to the division of Chlorophyta, Order Volvocales as evidenced by Harasawa (col. 19, lines 15-32). Additionally, Harasawa teaches other marine algal cells that belong to the class Bacillariophyceae or diatoms (col. 11, lines 58-60), including the family Naviculaceae (col. 12, line 53) (**Current claims 1, 6, 23-25, 40, 41 and 42**).

The combined disclosure of Hallmann and Harasawa fails to disclose *Phaeodactylum tricornutum* cells.

However, at the time the invention was made, Apt et al., successfully transform the diatom *Phaeodactylum tricornutum* of the class Bacillariophyceae using microparticle bombardment to introduce the sh ble gene from *Streptoalloteichus hindustanus* into cells (Current claims **26-28, 42, 43 and 44)**. Additionally, Apt et al., discloses specific fcp promoter regions used to drive gene and highly express a target gene (e.g., the cat reporter gene fused to a fcp promoter) including fcpA, fcpB, fcpC that could also be introduced by microparticle bombardment (Abstract, pp. 573, Fig. 1) (Current claims **29-31 and 45-47).** Apt et al., discloses that *P. tricornutum* is one of the most widely used model systems for studying diatoms, in particular in areas of ecology. The practical utilization of *P.* tricornutum transformation system contributes to the development of diatom molecular model systems (p. 578, col. 1, lat paragraph). Additionally, Fisher et al., teaches transformation of other diatoms other than *P. tricornutum* including *Cylindrotheca fusiformis* (*C. fusiformis)* with hexose/H+ symporter (HUP1) from *Chlorella.* Fisher et al, describes that the transporter was functionally incorporated into the membrane allowing *C. fusiformis* to take up labeled glucose and glucosamine (p. 114, col. 1 paragraph 2)

Therefore, it would have been *prima facie* obvious for one of ordinary skill in the art at the time the invention was made, to transfer the hexose/H+ symporter (HUP1) from *Chlorella* used to transform *Volvox* algae which is a Chlorophyta marine algal cell as taught by Hallmann et al. into any other photosynthetic autotroph marine algal cells such as the Baccilariophyta *P. tricornutum* in order to study whether said transformants comprising the HUP1 are able to transport glucose and thus able to grow in substantial absence of light or in total darkness, thereby become facultative heterotrophic. The

manipulation of previously identified DNA fragments and cell transformation systems of green algae, diatoms and red algae is within the ordinary level of skill in the art of molecular biology. In view that Hallmann discloses survival of transgenic *Volvox* algae after prolonged incubation in the dark in a glucose –containing medium, Apt et al., exemplifies transformation of the diatom species *P. tricornutum* with heterologous genes and Fisher et al., successfully exemplifies transformation of a different diatom species with the functional hexose/H+ symporter (HUP1) from *Chlorella,* one of ordinary skill in the art would clearly be motivated to transform the *P. tricornutum* of Apt with the HUP1 in order to obtain the expected benefit of growing *P. tricornutum* into substantial absence of light or in total darkness. One of ordinary skill in the art would have had a reasonable expectation of success in generating an algal cell which grows in the substantial absence of light or total darkness, said cell being phototrophic and comprising a chimeric DNA encoding a protein which will transport a catabolizable carbon source into the algal cell thereby growing on glucose in the substantial absence of light or in total darkness by combining the detailed teachings of Hallmann, Harasawa, Apt and Fisher.

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Claims 4, 9, 34, 36, 50 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) in view of Harasawa U.S. Patent 4,235,043 (Date of Patent Nov. 25, 1980) and further in view of Apt (*Mol Gen Gene*, 1996, 572-579) and Fisher et al., (1999*, J. Phycol* pp. 113-120, of record) as applied to claims **1, 6, 23, 24, 25, 26, 27, 28-31 and 40-47 above** and

further in view of Lemoine et al., (1999, FEBS Letters pp. 325-330). **This is a new rejection necessitated by amendment of the claims in the response filed 08/25/2009.**

The teachings of Hallmann, Harasawa, Apt and Fisher are outlined in the paragraphs above. The combined disclosure fails to teach a chimeric DNA encoding a disaccharide transporter.

However, at the time the invention was made, Lemoine et al., discloses that heterotrophic (or sink) organs in plants rely on the supply of photosynthates, mainly sucrose (e.g., disaccharide made of made from glucose and fructose), that enter the plant through specific carriers. Moreover, Lemoine et al., discloses that the cloning of the SUT1 gene encoding sucrose carrier by yeast complementation was the basis for identifying sucrose carriers in other yeast spices. Furthermore, Lemoine et al., discloses a cDNA encoding a sucrose transporter-like protein, specifically expressed in the pollen of tobacco plants.

Thus, it would have been *prima facie* obvious for one of ordinary skill in the art to determine whether both monosaccharide and disaccharide transporters are present in an algal cell to transport a catabolizable carbon source, e.g., hexose or sucrose and to study what type of transporter contributes to the algae growth in the substantial absence of light or total darkness, particularly because some algae are heterotrophs and Lemoine et al., discloses that heterotrophic (or sink) organs in plants rely on the supply of sucrose to thrive.

******

Claims 38 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hallmann et al., (1996, *Proc. Natl. Acad. Sci*, pp. 669-673, of record) in view of

Harasawa U.S. Patent 4,235,043 (Date of Patent Nov. 25, 1980) and further in view of Apt (mol Gen Gene, 1996, 572-579) and Fisher et al., (1999, *J. Phycol.* pp. 113-120, of record) as applied to claims **1, 6, 23, 24, 25, 26, 27, 28-31 and 40-47** above and further in view of Asano et al., (*J Biol Chem* 1991 pp. 24632-6). **This is a new rejection necessitated by amendment of the claims in the response filed 08/25/2009.**

The teachings of Hallmann, Harasawa, Apt and Fisher are outlined in the paragraphs above. The combined disclosure fails to teach a chimeric DNA encoding a Glut1 transporter.

However, at the time the invention was made, Asano et al., discloses cloning of the wild type GLUT1 cDNA and mutants into a vector to transform Chinese hamster ovary cells to study residues that have an important role in maintaining the structure of glucose transporter with high affinity for glucose, thus, with high transport activity (Abstract).

Therefore, it would have been *prima facie* obvious for one of ordinary skill in the art at the time the invention was made, to substitute the GLUT1 hexose transporter of Asano et al. for the HUP1 hexose transporter of Hallmann to produce an algal cell culture according to the limitations of the instant claims 38 and 54.

Motivation to combine these teachings is found in the nature of the problem to be solved by the algal cell culture of Hallmann which intended to clone a heterologous *Chlorella* HUP1 gene to into photoautotrophic microalgal cells to transport glucose and thus be able to grow in substantial absence of light or in total darkness, thereby become facultative heterotrophic. The manipulation of previously identified DNA fragments and

cell transformation systems of green algae, diatoms and red algae is within the ordinary level of skill in the art of molecular biology.

Absent evidence to the contrary, one would have a reasonable expectation of success in combining these teachings to generate an algal cell which grows in the substantial absence of light, particularly because Hallmann et al. provides detailed instruction as to how to transform *Volvox* algae with a functional HUP1 from *Chlorella* to transport glucose, and Asano successfully clone GLUT1 cDNA and express GLT1 in transformed mammalian with high Glucose transport activity. One of ordinary skill in the art would have a reasonable expectation of success in generating an algal cell which grows in the substantial absence of light or total darkness, said cell being phototrophic and comprising chimeric DNA encoding a protein which will transport a catabolizable carbon source into the algal cell by combining the detailed teachings of Hallmann, Harasawa, Apt, Fisher and Asano.

Conclusion

Claims 1-10 and 23-55 are rejected.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Leavitt whose telephone number is 571-272-1085. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Woitach, Ph.D can be reached on (571) 272-0739. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Group Art Unit 1633; Central Fax No. (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to (571) 272-0547.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Maria Leavitt/

Maria Leavitt
Primary Examiner, Art Unit 1633